UNDERGROUND INJECTION CONTROL
PERMIT APPLICATION

Ute Tribal # 03-12
2272' FSL & 575' FWL
Sec. 3, T5S-R3W
Duchesne County, Utah
API # 43-013-31706

July 2015

Prepared for:
Bruce Suchomel
Groundwater Program, Mail Code 8P-W-UIC
U.S. Environmental Protection Agency
1595 Wynkoop St
Denver, CO 80202-1129

Prepared by:
Petroglyph Energy, INC.
960 Broadway Avenue, Suite 500, P.O. Box 70019
Boise, Idaho 83707
(208) 685-7600
FAX (208) 685-7605

UNDERGROUND INJECTION CONTROL
PERMIT APPLICATION

- HEADER ON CBL UNREADABLE
- SUNDRY REPORTS
- CBLS FOR AOR WELLS

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LIST OF ATTACHMENTS

Attachment No. 1	Area Topography Map
Attachment No. 2	Site Map
Attachment No. 3	Map of the A-Marker surface
Attachment No. 4	Cross-Sections of the injection formation
Attachment No. 5	Water Analysis
Attachment No. 6	Completion data for all wells in the AOR
Attachment No. 7	CBL for the UIC well
Attachment No. 8	Open hole log for the UIC well
Attachment No. 9	List of owners and Affidavit Notification
Attachment No. 10	Well bore diagrams for the UIC well
Attachment No. 11	P&A procedure
Attachment No. 12	MIT procedure
Attachment No. 13	Surety Bond letter

SUMMARY DOCUMENT
UIC WELL APPLICATION
Ute Tribal 03-12
API # 43-013-31706

The following document contains information provided in support of the application for the conversion of the Ute Tribal 03-12 well to an injection well in the Green River formation in the Antelope Creek Field in Duchesne County, Utah.

The Antelope Creek Field falls within the Uintah and Ouray Indian reservations and is within Indian Country; therefore, for facilities located on the reservation, only EPA-issued UIC permits are necessary for compliance with UIC regulations.

The EPA has issued an Area Permit #UT20736-00000 for the Underground Injection Control for the Antelope Creek Field. This area permit allows for additional producing wells to be converted to injection wells for enhanced recovery.

(1) Petroglyph Energy, Inc. (Petroglyph) is the operator and only working interest owner of wells located in the Antelope creek Field, Duchesne County, Utah. Petroglyph's business address is provided below:

Petroglyph Energy, Inc.
960 Broadway Avenue, Suite 500
P.O. Box 70019
Boise, ID 83707

(2) Enclosed as Attachment No. 1 is a topographic map of a portion of the Antelope Creek Field, identifying all wells located in this area. The legal location for the Ute Tribal 03-12 is 2272' FSL & 575' FWL NW/SW Sec. 3, T5S-R3W.

(3) Attachment No. 2 is a map of the well. This map shows a circle with a ¼ mile radius centered on the Ute Tribal 03-12 well. The ¼ mile radius encompasses the area of review, AOR, within which Petroglyph is required to investigate all wells for mechanical integrity. The ¼ mile radius also identifies mineral ownership; all lands within the AOR are leased to Petroglyph by the Ute Tribal as indicated by yellow shading. The AOR has Ute Tribal 03-05 and Ute Tribal 04-09 well(s) located in its ¼ mile radius.

(4) Petroglyph proposes to utilize the Ute Tribal 03-12 as an injection well for enhanced recovery in the Antelope Creek Field.

(5) Injection Zone – The injection intervals are between 4170' and 6150' True Vertical Depth and located in the lower portion of the Green River Formation. The injection zone is confined within a 1980' section between the Green River "A" Lime marker bed and the top of the Basal Carbonate in the lower part of the formation. The injection zone is composed of lenticular calcareous sandstones interbedded with low permeable carbonates and calcareous shales. The lenticular sandstones vary in thickness from 1 to 30 feet.

Confining Zone – The overall confining strata above the injection zone consists of impermeable Green River calcareous shales and continuous beds of microcrystalline dolostone. The confining zone in the Ute Tribal 03-12 is 243 feet thick.

Attachment No. 3 is a structure map of the A-Marker surface.

Attachment No. 4 is a cross-section of the injection interval and confining zone.

(6) Enclosed as Attachment No. 5 are standard analyses of produced water from three batteries that currently serve as central handling facilities for all project producing wells. The analysis of the Green River formation water from the Ute Tribal 18-08 Satellite Battery is 12805 mg/L of total dissolved solids (TDS), Ute Tribal 21-11 Satellite Battery is 15659 mg/L TDS, and Ute Tribal 34-12-D3 Satellite Battery is 14590 mg/L TDS.

Injectate in the field is a mixture of produced water and fresh make-up water. The nearest injection well is the Ute Tribal 03-14, the most recent analysis of the water being injected into the Green River formation at this location is 6393 mg/L TDS. This analysis is also included in Attachment No. 5.

(7) A summary of completion data from the Ute Tribal 03-12 and offset wells in the AOR are included in Attachment No. 6

(8) The cement bond log is included in Attachment No. 7.

(9) The open hole log for the Ute Tribal 03-12 is included in Attachment No. 8.

(10) The Antelope Creek Field is operated under a Cooperative Plan of Development between the Ute Tribe and Petroglyph Energy. At the Ute Tribal 03-12 location, all mineral owners, surface owners and operators located within the AOR ¼ mile radius have been notified of the submitted EPA application to convert to injection. Attachment No. 9 is the Affidavit of Notification to all owners.

(11) Petroglyph requests a maximum surface injection pressure of **1900**psi. The EPA Area Permit No. UT20736-00000 uses the formula:

Pm = (0.88psi/ft - 0.43psi/ft(Sg)) D

Where:
Pm = Maximum surface injection pressure
0.88psi/ft = Fracture gradient
D = Top perforation depth
0.43psi/ft = Hydrostatic pressure/hydraulic head
Sg = Specific gravity of injection fluid

For the Ute Tribal 03-12:
1942psi = (0.88psi/ft - 0.43(1.00)) 4316ft

EPA Area Permit No. 20736-00000 further caps maximum surface pressure at 1900psi.

(12) Three wellbore diagrams for the Ute Tribal 03-12 are in Attachment No. 10. One diagram is for production, one for injection, and one for Plug & Abandonment (P&A).

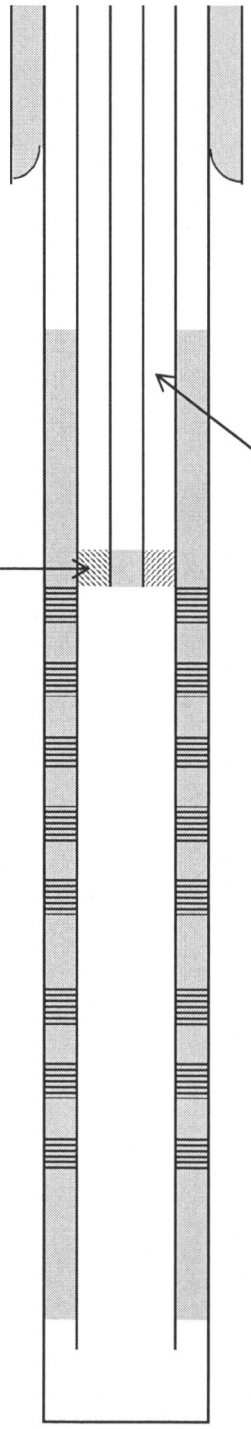
(13) The P&A procedure for this well is shown in Attachment No. 11.

(14) Once the draft permit is issued, Petroglyph will conduct a Mechanical Integrity Test and a static bottom-hole pressure test. The MIT procedure is contained in Attachment No. 12. The conversion work will be satisfactorily completed and submitted to the EPA on Form 7520-12. A wellbore schematic will be included with this form.

(15) Petroglyph will give proof of financial responsibility by posting a surety bond for the UIC well prior to final permit approval. A copy of this letter is contained in Attachment No. 13.

(16) Petroglyph will install various gauges on the well so that the injection pressure and tubing/casing annulus pressure can be monitored. The well will be equipped with a flow meter with a cumulative volume recorder.

Ute Tribal 03-12 Injection



GL: 5955'
KB: 5965'

Well History:
Spud Well: 9/21/1996
Completed: 10/21/1996
First Production: 11/13/1996

Tops (KB)
BMSW* Found at 965'
Green River 1490'
A Marker 4170'
X Marker 4671'
Douglas Creek 4818'
B Limestone 5220'
Castle Peak 5723'
Basal Carbonate 6150'

8 5/8" 24# Surface CSG @ 251' KB
cmt'd w/150 sx

Surface Hole size 12 1/4"

Hole Size 7 7/8" bit

Cement top @ 2290'
5 1/2" 15.5# J-55 CSG @ 5963'
cmt'd w/480 sx

Tubing 2 7/8" 6.5# J55

Injection Packer @ 4226'

Perf's:
B05 4316' to 4330'
B05 4347' to 4350'
B07+ 4480' to 4492'
B10 4566' to 4576'
B11 4612' to 4615'
B11 4615' to 4620'
C08.1 5081' to 5084'
C08.1 5084' to 5090'
C08.1 5090' to 5095'
D3 5380' to 5384'
E01.1 5781' to 5782'
E01.1 5782' to 5784'
E01.1 5784' to 5789'
E01.1 5789' to 5791'
E01.1 5791' 5792'

Petroglyph Operating Co., Inc.
Ute Tribal #03-12
(2272' FSL & 575' FWL)
NW SW Section 3, 5S- 3W
Antelope Creek Field
Duchesne Co. Utah
API#: 43013317060000

PBTD @ 5914' KB

*Plate 1 Utah Geological Survey Special Study 144. (2012). *BMSW Elevation Contour Map, Uinta Basin, Utah.* [map]. (CA 1:200,000)

(Not to Scale)

TD @ 6473' KB

Ute Tribal 03-12 Well History

Well History:

Spud Well: 9/21/1996

Completed: 10/21/1996

First Production: 11/13/1996

Tops (KB):

BMSW* Found at 965'

Green River 1490'

A Marker 4170'

X Marker 4671'

Douglas Creek 4818'

B Limestone 5220'

Castle Peak 5723'

Basal Carbonate 6150'

Pefr History

10/15/1996

B10	4566' to 4576'
B11	4615' to 4620'
C08.1	5084' to 5090'
E01.1	5782' to 5784'
E01.1	5789' to 5791'

7/12/2011

B05	4316' to 4330'
B05	4347' to 4350'
B07+	4480' to 4492'
B10	4557' to 4566'
B10	4576' to 4578'
B11	4612' to 4615'
C08.1	5081' to 5084'
C08.1	5090' to 5095'
D3	5380' to 5384'
E01.1	5781' to 5782'
E01.1	5784' to 5789'
E01.1	5791' to 5792'

Petroglyph Operating Co., Inc.

Ute Tribal #03-12

(2272' FSL & 575' FWL)

NW SW Section 3, 5S- 3W

Antelope Creek Field

Duchesne Co. Utah

API#: 43013317060000

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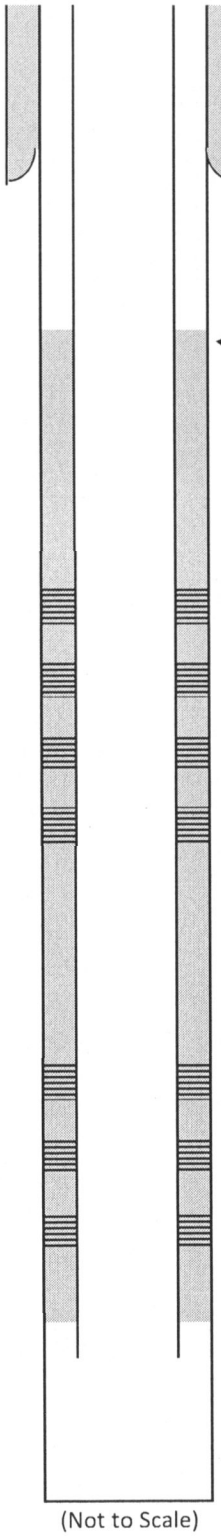

(Not to Scale)

GL: 5955'

KB: 5965'

8 5/8" 24# Surface CSG @ 251' KB

cmt'd w/150 sx

Surface Hole size 12 1/4"

Cement top @ 2290'

5 1/2" 15.5# J-55 CSG @ 5963'

cmt'd w/480 sx

Hole Size 7 7/8" bit

Perf's:

B05 4316' to 4330'

B05 4347' to 4350'

B07+ 4480' to 4492'

B10 4566' to 4576'

B11 4612' to 4615'

B11 4615' to 4620'

C08.1 5081' to 5084'

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D3 5380' to 5384'

E01.1 5781' to 5782'

E01.1 5782' to 5784'

E01.1 5784' to 5789'

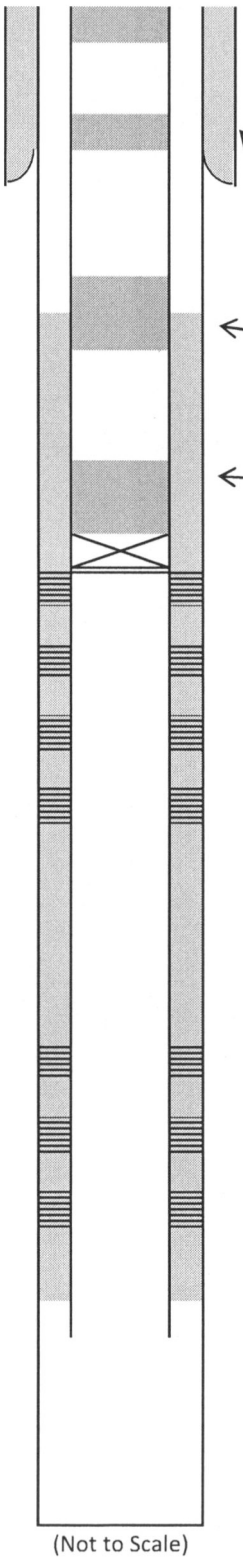
E01.1 5789' to 5791'

E01.1 5791' 5792'

PBTD @ 5914' KB

TD @ 6473' KB

Ute Tribal 03-12 Plug and Abandonment



8sx Class G Cement-50' plug

30sx Class G cement-200' plug

30sx Class G cement-200' plug

CIBP @ 4226'

GL: 5955'

KB: 5965'

8 5/8" 24# Surface CSG @ 251' KB

cmt'd w/150 sx

Surface Hole size 12 1/4"

Hole Size 7 7/8" bit

Cement top @ 2290'

5 1/2" 15.5# J-55 CSG @ 5963'

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PBTD @ 5914' KB

TD @ 6473' KB

(Not to Scale)

Petroglyph Operating Co., Inc.

Ute Tribal #03-12

(2272' FSL & 575' FWL)

NW SW Section 3, 5S- 3W

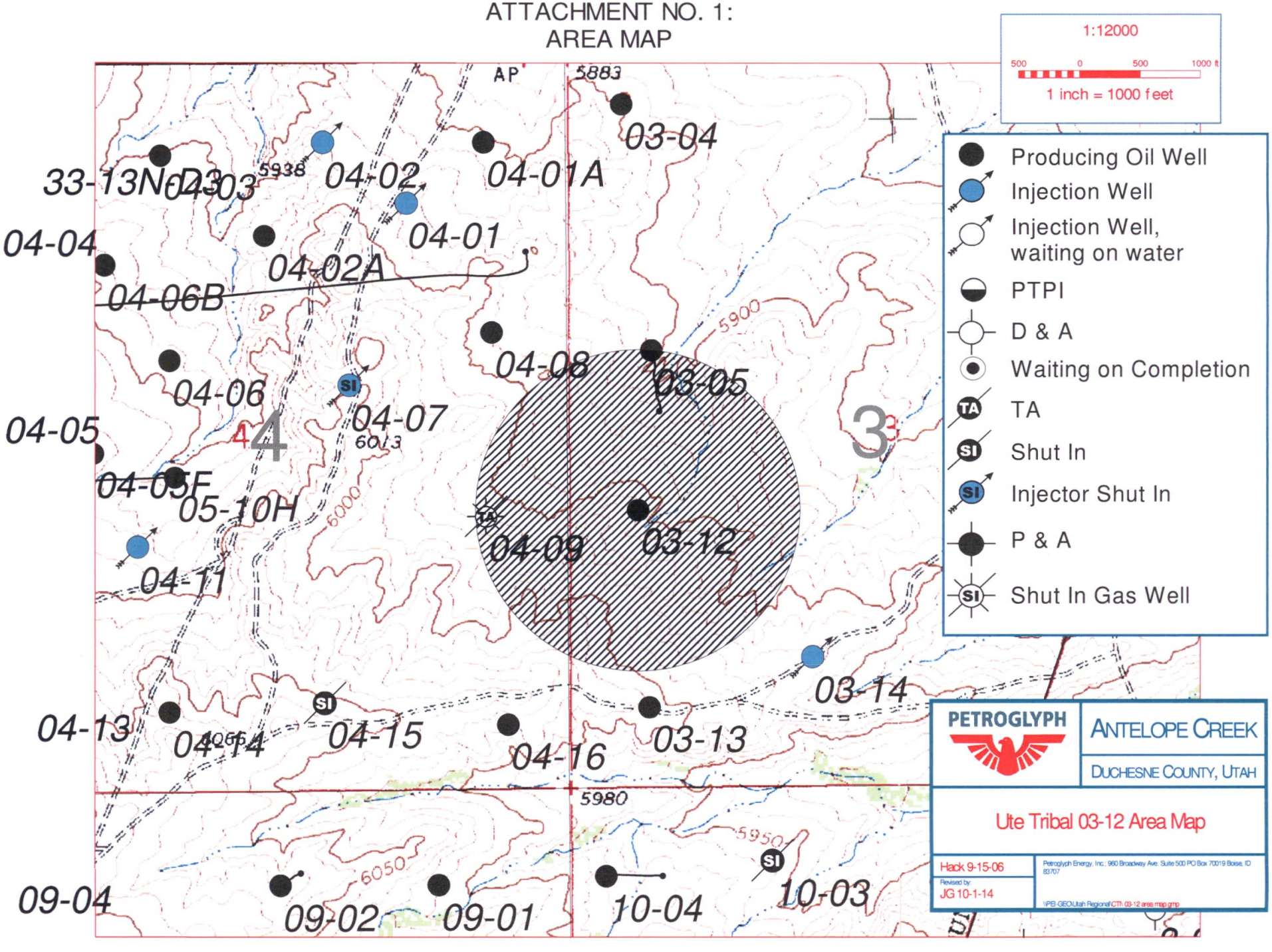
Antelope Creek Field

Duchesne Co. Utah

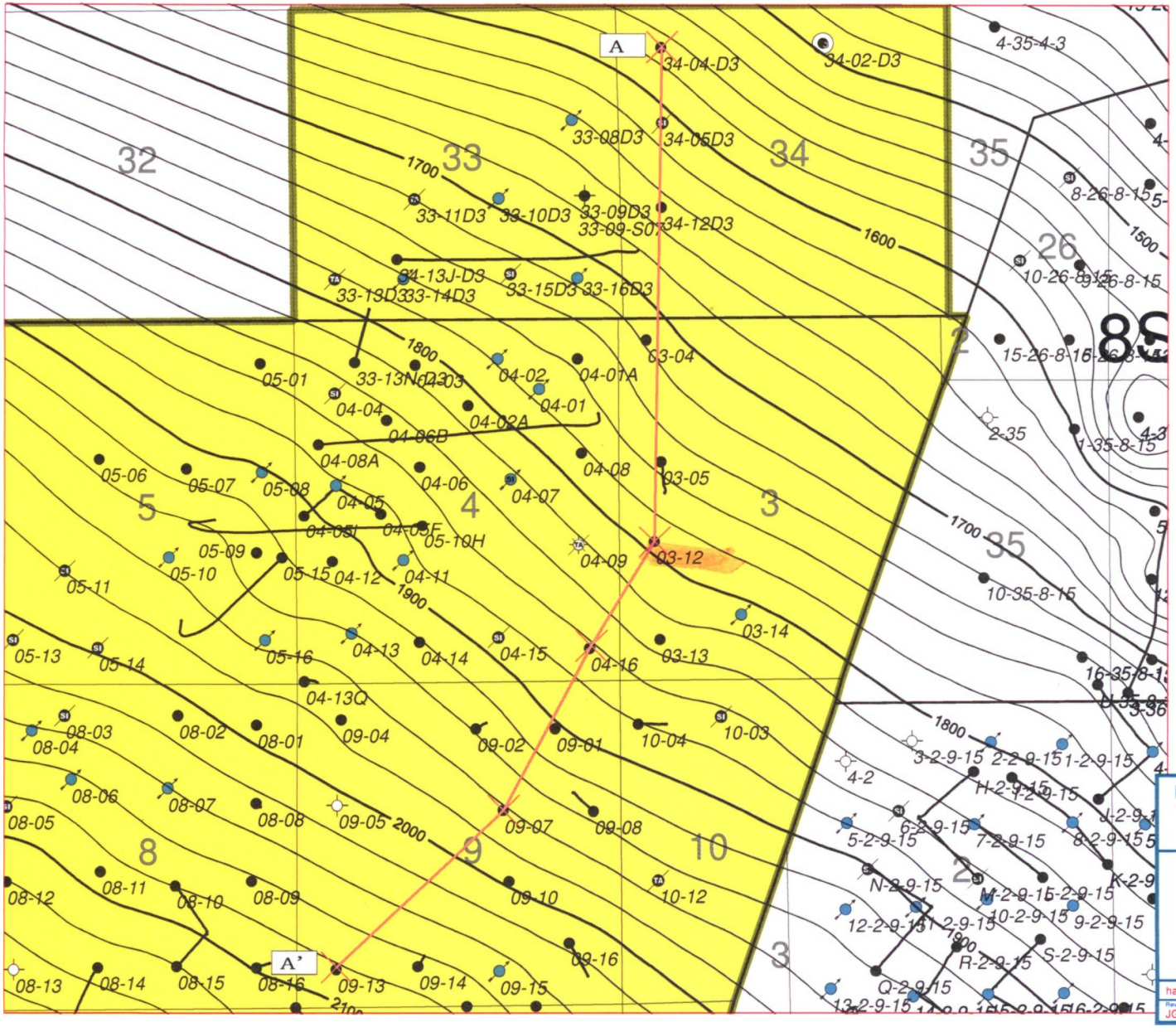
API#: 43013317060000

*Plate 1 Utah Geological Survey Special Study 144. (2012). *BMSW Elevation Contour Map, Uinta Basin, Utah,* [map]. (CA 1:200,000)

ATTACHMENT NO. 1:
AREA MAP



ATTACHMENT NO. 3:
Map of the "A" Lime Marker



1:30000

1000 0 1000 2000 ft

1 inch = 2500 feet

- Producing Oil Well
- Injection Well
- Injection Well, waiting on water
- PTPI
- D & A
- Waiting on Completion
- TA
- Shut In
- Injector Shut In
- P & A
- Shut In Gas Well

PETROGLYPH

ANTELOPE CREEK

DUCHESNE COUNTY, UTAH

Structure Map of the "A" Lime Marker
(approximate top of Injection Zone)
in the Vicinity of the
Ute Tribal 03-12
With Line of Cross Section A to A'

hack 7-11-06

Revised by:
JG 10-3-14

Petroglyph Energy, Inc.: 555 S. Cole Rd., Boise, ID 83709

\\SERVIGeo\Utah Regional\ CT\03-12 structure map.gmp

Maximum Allowable Injection Pressure (MAIP)
From Fracture Gradient

Date: 09/04/2015 *Operator:* **Petroglyph**

Well: **Ute Tribal 03-12**

Permit #:

Enter the following values:

Specific Gravity of injectate =	**1.010**	g/cc
Depth to top of injection interval =	**4,170**	feet
Fracture Gradient (F G) =	**0.880**	psi/ft

MAIP = **1,845** psig

(rounded down to nearest 5 psig)

where:

*MSIP = [FG - (0.433 * SG)] * Depth to top of injection interval* = *1845.934*

Cement Bond Index (in millivolts - mV)

Date: September 4, 2015

Operator: **Petroglyph**

Well: **Ute Tribal 20-07**

Permit :

Enter the following values:

Amplitude at 0% Bond (A-0) (in mV) = **72** *mV*

Amplitude at 100% Bond (A-100) (in mV) = **1** *mV*

Amplitude at 80% Bond (A-80) = **2.4** *mV*

[(0.2)log A0 + (0.8)log A100]

Amplitude at 90% Bond (A-90)= 1.5 *mV*

[(0.1)log A0 + (0.9)log A100]

Amplitude at 70% Bond (A-70)= 3.6 *mV*

[(0.3)log A0 + (0.7)log A100]

Amplitude at 60% Bond (A-60)= 5.5 *mV*

[(0.4)log A0 + (0.6)log A100]

~~Newfield Production~~ - Technical Review Worksheet

Permit No: UT2 Well: UT 3-12

What Needs to be Done	Information Sources	Review & Evaluation Notes
Determine name, top and base of the confining zone(s) and the injection zone(s).	☐ Geologic data submitted ☐ Well logs from area ☐ Published articles	Conf Zone: top 3927 base 4170 Inj Zone: top 4170 (Garden Gulch 2-Marker) base 6150 (top Wasatch)
Determine name, top and base of all USDWs. List base of lowermost USDW: Determine which USDWs are actually being used for water supply.	☐ Geologic data submitted ☐ nearby Water analyses ☐ nearby Well logs ☐ Water supply wells ☐ Published articles	Surface Elevation: GL 5955 KB 5965 Pub #92 base USDW: bgs: elev: submitted base USDW bgs: 965 elev: base of Uinta / top Green River: 1490
Review and evaluate construction, casing and cementing records of proposed well.	☐ Data submitted ☐ Completion/workover reports ☐ Contractor invoices ☐ Logs: CBL, RTS, Temp, casing inspection, etc.	TD: 6473 PBTD: NOT DEFINED surface csg 8 5/8" 24# ft 0-251' s: long strg csg 5 1/2" 15.5# ft 0-5963 s: TOC: submitted: 2290 CBL: 2320 Wells in AOR: TD TOC C 03-05 6472 SURF 04-09(TA) 6630 2370
Review and evaluate construction, casing and cementing records of AOR wells that penetrate injection zone.	72/1 2.4=>80% OK	
Review P&A plan for effective USDW protection, injection zone isolation and well closure.	☐ P&A plan ☐ Area geology	plug depths:
Review amount of FR - is it adequate to cover P&A costs of proposed in P&A plan?	☐ contractor bids / P&A cost histories ☐ nearby well P&A costs	FR instrument: Amount: $
Calculate the maximum allowable injection pressure (MAIP).	☐ Fracture treatments ☐ Step Rate Test results ☐ Fracture gradient	top perforation: bottom perforation: injectate specific gravity: 1.01 Frac Gradient: .88 p initial MAIP = 1845 psi
Determine which logs and tests will be performed.		

Structural Cross Section A to A' in the Vicinity of Ute Tribal 03-12

43013515540000	8109 ft	43013317060000	1998 ft	43013512130000	3035 ft	43013515210000	3722 ft	43013511990000
PETROGLYPH OPERATING COMPANY UTE TRIBAL 34-04-D3 660 FNL 762 FWL TWP: 4 S - Range: 3 W - Sec. 34		PETROGLYPH OPERATING COMPANY INC Ute Tribal 03-12 2272 FSL 575 FWL TWP: 5 S - Range: 3 W - Sec. 3		PETROGLYPH OPERATING COMPANY UTE TRIBAL 04-16 589 FSL 480 FEL TWP: 5 S - Range: 3 W - Sec. 4		PETROGLYPH OPERATING COMPANY UTE TRIBAL 09-07 2087 FNL 1910 FEL TWP: 5 S - Range: 3 W - Sec. 9		PETROGLYPH OPERATING COMPANY UTE TRIBAL 09-13 650 FSL 657 FWL TWP: 5 S - Range: 3 W - Sec. 9